

Meteorological Tower Protocol

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RadNet Meteorological Tower Protocol

Thursday, February 19, 2004



RadNet Standard Header

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RadNet Message Header Format

The RadNet header contains the **first 55 bytes** of all RadNet messages. The header is intended to provide information regarding the operational status and location of an instrument. The header provides information regarding which instruments are (or are not) operating properly.

Field Name	Type	Position	Codes	Notes
Header Check Sum	Byte	1		The first byte (01, byte) is a checksum, to ensure the integrity of the header transmission. The checksum is the sum of bytes 2 through 55.
RadNet Version Number	Byte	2	See RadNet Versions Page	The second byte (02, byte) is the RadNet version number. It is used to indicate the version of the RadNet message. The receiving software is responsible for handling all received RadNet messages, although the most current version's functionality may not be provided.
Message Codes	Byte	3	See RadNet Message Codes Page	Byte (03) is the message code. The message code tells what type of RadNet message has been sent (status, check source, etc.).
Server Address	Word	4-5	None	Bytes (4-5) are the server address (1-64,536) of the pushing device. Since each instrument may perform as its own server, two bytes are used.
Monitor Address	Byte	6	None	Byte (6) is the address (1-256) of a specific monitor hooked up to a server. This protocol is intended to support existing (RS-485) systems. The practicality of hooking up more than 256 monitors to a single RadNet server is questionable.
Server Status	Byte	7	See RadNet Server Status Codes Page	Byte (7) is a code to display the status of the server. Codes are provided for normal as well as a variety of abnormal conditions.
Hardware Status	Byte	8	See Op/Hw Status Page Codes Page	Byte (8) is a code to display the overall Hardware Status of the instrument. Hardware status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument hardware malfunctions generally require repair work. Other conditions could be attributed to either hardware or operational problems. The instrument vendors are responsible for classifying conditions and prioritizing the status

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				change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage, and low background, then the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as a HV power supply failure.
Operational Status	Byte	9	See Op/Hw Status Page Codes Page	Byte (9) is a code to display the overall Operational Status of the instrument. Operational status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument operational problems generally require response by health physics personnel. Other conditions can be attributed to either hardware or operational problems. The instrument vendors are responsible for classifying conditions and prioritizing the status change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage, and low background, then the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as a HV power supply failure.
Location	Char[40]	10-49	None	Bytes (10-49) are for the location of the instrument. Location designations are highly individual, so no convention or specification is given. The location label must be left justified. Unused characters must be padded with space characters.
Authentication Byte Count Offset	Word	50-51		The length in bytes of the original message. If non-zero, indicates that authentication is in effect. If zero, then authentication is not implemented See the following web pages for more information: Background Information RadNet Implementation, Authentication, Encryption

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Authentication Status	Byte	52	See RadNet Authentication Status Codes Page	"Invalid" flag. This byte is always set to zero when the message is transmitted. Authentication services set this byte to a non-zero value if the message fails signature verification. Clients check this byte with zero meaning valid data and take appropriate "bad data" action if the byte is non-zero. See the following web pages for more information: Background Information RadNet Implementation , Authentication , Encryption
Reserved For Future Use	Byte	53	None	Byte (53) is reserved for future use and must be filled with zero values until specified by the protocol
Monitor Type	Word	54-55	See RadNet Monitor Type Codes Page	Bytes (54-55) are a code for the instrument type.

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Meteorological Tower Body Format

The Meteorological Tower (Met Tower) body message has data conforming to generic Met Tower formats and provides real-time weather data. The message also carries specific information regarding a Met Tower instrument's readings. A RadNet header must precede all body messages. The RadNet header contains the first 55 bytes of a RadNet message.

Field Name	Type	Position	Codes	Notes
R1	Float	56-59	N/A	Reserved for Future use
R2	Float	60-63	N/A	Reserved for Future use
Unique ID Preamble	Char [4]	C[1] = 64 C[2] = 65 C[3] = 66 C[4] = 67	N/A	<p>The Unique ID Preamble is used in conjunction with the Unique ID. By combining Unique ID Preamble and the Unique ID we obtain a totally unique ID for the message. This ID is used to connect different Met Tower messages with each other and also allows two database table (RadNet messages) to be joined by a foreign key relationship.</p> <p>If an Other RadNet instrument is combined with a Met Tower, then the Met Tower will use the instrument Unique ID and Preamble ID for its messages. This use will allow the instrument reading and the Met Tower reading to be joined together at the monitoring computer or within a database. When deploying a "smart" Met Tower, it will look for packets from instruments within its area (using server and monitor address, or by IP address). When it sees a RadNet broadcast message, it will capture the Unique ID of the instrument, then it can create a Met Tower message and ship its reading using the captured Unique ID.</p> <p>Another method is to have the instrument look for the Met Tower packets and capture its Unique ID, then use the met tower data for calculation. The instrument can send out the calculated readings onto the network using the Met Tower information and could use its own Preamble ID and the Met Tower's Unique ID.</p> <p>The goal here is to be able to combine the Met Tower data with the instrument data and allow the end user to dictate how it</p>

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				would be implemented. How this is used would be defined by the needs of the end users. The Met Tower may handle the task, or instrument on the network, or users may want the monitoring computers to combine the data.
Unique ID	Float	68-71	N/A	Date + Time + any other unique value (e.g., mmddyyhhmmss + monitor address + server address = 1202970812970462). If multiple messages are sent, the Preamble ID+ Unique ID is used to match the multiple messages to one another as they are received by the client monitoring computer. See comments above..
Met Tower Message Type	Byte	72	See Met Tower Message Type Codes Page	This byte (72) is the Met Tower Message Type Code and is intended to provide information about the type of message being pushed. This information will indicate if there is transactional (or other) data following this byte.

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Meteorological Tower Measurement Footer Format

The Meteorological Tower Measurement (Met Tower) footer message has data conforming to generic Met Tower formats. A RadNet header and meteorological body must precede all footer messages. The header contains the first 55 bytes of a RadNet message, the Met Tower body contains the next 17 bytes, for a total of 72 bytes preceding the footer.

"Repeating Frames" bytes are shown as $(131+y)+10(x)$. The 131 represents the 131 bytes that precede the footer. The "y" is the number of bytes that have preceded the value in that channel frame. The number 10 is the number of bytes in the repeating frame. The "x" is the number of channel iterations that have occurred before the byte value is examined.

Note: Red Field Names = Repeating Fields

Field Name	Type	Position	Codes	Notes
Month	Byte	73	N/A	Month of the year
Day	Byte	74	N/A	Day of the month
Year	Word	75-76	N/A	Four digit year
Hour	Byte	77	N/A	Hour of the day
Minute	Byte	78	N/A	Minute of the hour
Seconds	Byte	79	N/A	Second of the minute
Number of Satellites	Byte	80	N/A	Number of satellites currently being seen by the GPS
Latitude	Float	81-84	See RadNet Unit Codes	Units = Latitude in degrees
Latitude Hemisphere	Byte	85	See RadNet Unit Codes	North = 25 South = 26
Longitude	Float	86-89	See RadNet Unit Codes	Units = Longitude in degrees
Longitude Hemisphere	Byte	90	See RadNet Unit Codes	East = 27 West = 28
Altitude	Float	91-94	See RadNet Unit Codes	Units = Mean Sea Level
Altitude Units	Byte	95	See RadNet Unit Codes	Meter = 33 Feet = 34
Temperature	Float	96-99	See RadNet Unit Codes	Units = Degrees C
Humidity	Float	100-103	See RadNet Unit Codes	Units = Percent
Wind Direction	Float	104-107	N/A	Units = Degrees 90 degrees = east 180 degrees = south
Wind Average Direction	Float	108-111	N/A	Units = Degrees 90 degrees = east 180 degrees = south
Wind Speed	Float	112-115	N/A	

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Wind Average Speed	Float	116-119	N/A	
Wind Sigma-Theta	Float	120-123	N/A	<p>Units = Degrees</p> <p>Sigma Theta is the fluctuation in the wind. Or more technically it is the horizontal turbulence of the wind. We use Sigma Theta to estimate the potential for the atmosphere to spread a plume in HotSpot. The EPA provides guidance to calculate a common plume dispersion index (Pasquill Stability Class) from measurements of wind speed and sigma theta.</p>
Wind Units	Byte	124	See RadNet Unit Codes	<p>Knots = 29, Knots per hour = 30 Meters per second = 31 Meter per hour = 32</p>
Stability Class	Byte	125	See Meteorological Tower Stability Class Type Codes	<p>Stability Class is used to determine the spread of a plume. There are accepted equations for the width and height of a plume given the distance from the source and the Stability class. To estimate stability class for HotSpot we use a method suggested by the EPA. The wind speed and sigma theta are combined in this method. There are other methods for estimating stability class. An old one uses wind speed and percent cloud cover. Another method uses solar radiation and wind speed in the daytime, and vertical temperature difference and wind speed at night. There are six Stability Class categories: A through F. The Unstable classes (A, B, and C) occur during the daytime. The Stable classes (E and F) only occur at night. The Neutral class can occur during the day or night. Class A is the Very Unstable and</p>

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				corresponds to hot, calm days and leads to the greatest amount of dispersion. A plume is broken up and spread wide with A Stability. Class D is neutral. It corresponds to windy days or the transition times of dawn and dusk. This is the most frequently occurring stability class. Class F is Very Stable and corresponds to nights with low winds. A plume experiencing F Stability will feature very little dispersion. Here is a link to a short on-line tutorial on many aspects of atmospheric dispersion and stability if someone ever asks about it http://www.shodor.org/metweb/session6/stable.html
Number Of Channels	Word	126-127	N/A	Bytes (56-57) are the number of Met Tower channels that will be presented as repeating frames in the footer.
Channel Number	Word	$[(128+10x)-(129+10x)]$	N/A	The first byte $[(127+10x)-(128+10x)]$ is the Channel Number/Detector Number presented in the frame. The Channel number can be used to indicate the device/channel number that is supplying the data. Although not strictly required, since the frame length and number of frames are known, having the channel number in the frame can assist when troubleshooting. The intended use is as follows: If the Met Tower has 10 detectors and two channels per detector (temperature and humidity), the footer would contain 20 frames. You could pass temperature in frames 1- 10 and humidity in 11 -20.
Channel Type	Byte	$(130x+10x)$	See Channel Types Page	Byte $(129+10x)$ of the repeating frame is a code for Channel Type.
Channel Hardware Status	Byte	$(131+10x)$	See Op/Hw Status Page	Byte $(130+10x)$ is a code for the Hardware Status of the Channel.
Channel Operational Status	Byte	$(132+10x)$	See Op/Hw Status Page	Byte $(131+10x)$ is a code for the Operational Status of the Channel.
Reading	Float	$[(133+10x) - (136+10x)]$	N/A	Byte $[(132+10x) -(135+10x)]$ is the reading for the channel.
Units	Byte	$(137+10x)$	See RadNet Units Codes	Bvte $(136+10x)$ is a code for the Units of

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				the reading.
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Meteorological Tower Status Message

The Meteorological Tower (Met Tower) Status Message is used to transmit the status of the instrument while it is collecting/analyzing the data. Because the Met Tower instrument may be required to collect data or supply human readable text messages, RadNet provides this method to allow the instrument to inform the user of problems that may exist with the instrument.

If the "Number of Messages" field is set to 0, then no data will be found past byte 74. However, if "Number of Messages" is set to a value greater than 0, then the instrument has sent a ASCII text message that can be displayed or archived. If the message is less than 40 characters long, then the instrument will pad the remaining space with space characters (Hex value = 20x or decimal value = 32). If the text is greater than 40 characters then add another status message and increment the Number Of Messages field.

The instrument is still required to set the Operational and Hardware Status codes within the RadNet Header. Upon any status change within the instrument, the instrument shall push a status message and or measurement message. If the instrument does not have valid data, then it can ship a status message upon detecting a hardware or operational event.

When a valid analysis has been completed by the instrument, it shall push the data using the measurement message. Subsequently, the instrument should resume sending status/measurement messages at the normal/abnormal push rates. The instrument manufacturer may choose to never ship a status message and always ship a measurement message. This practice is acceptable within the RadNet guidelines, however, the instrument can not ship only status messages, it must also ship a measurement message at the normal/abnormal push rates or when it has valid data.

The instrument manufacturer is responsible for deciding to implement the support of text messages and it is not a requirement of the RadNet protocol. This option may or may not be implemented on all instrumentation.

The instrument manufacturers will define what messages to support and their content. Instrument manufacturers will also define how many messages will be combined into 1 RadNet packet. Some instrument manufacturers may combine messages to reduce overhead and network traffic, while others will send only one status message per packet as the event occurs.

Here is an example of how this might be used:

Packet Number 1	Number Of Messages = 3	Message 0= 'Taking Background Reading' Message 1= 'Stabilizing detector' Message 2= 'Counting Sample'
Packet Number 2	Number Of Messages = 4	Message 0= 'Moving Sample' Message 1= 'Sample Placed' Message 2= 'Stabilizing The Detector' Message 3= 'Counting Sample'"
Packet Number 3	Number Of Messages = 1	Message 0= 'Count Complete, Analyzing Data'
Packet Number 4	Number Of Messages = 4	Message 0= 'Analysis complete' Message 1= 'Shipped Measurement' Message 2= 'Shipped Spectrum' Message 3= 'Standing By.'
Packet Number 5	Number Of Messages = 0	No extra status message sent, instrument using standard

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		RadNet status messages to indicate the current state of the instrument.
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Field Name	Type	Position	Codes	Notes
Number Of Messages	Word	73-74	N/A	Byte (73-74) is the number of repeating messages (frames) that are after this value If Number Of Messages = 0 then the client software should ignore the remaining byte.
Status Message	Char[40]	C[1]=75 C[2]=76 C[3]=77 C[4]=78 C[5]=79 C[6]=80 C[7]=81 C[8]=82 C[9]=83 C[10]=84 C[11]=85 C[12]=86 C[13]=87 C[14]=88 C[15]=89 C[16]=90 C[17]=91 C[18]=92 C[19]=93 C[20]=94 C[21]=95 C[22]=96 C[23]=97 C[24]=98 C[25]=99 C[26]=100 C[27]=101 C[28]=102 C[29]=103 C[30]=104 C[31]=105 C[32]=106 C[33]=107 C[34]=108 C[35]=109 C[36]=110 C[37]=111 C[38]=112 C[39]=113 C[40]=114		If the "Number of Messages" field is set to 0, then no data will be found past byte 74. However, if "Number of Messages" is set to a value greater than 0, then the instrument has sent an ASCII text message that can be displayed or archived. If the message is less than 40 characters long, then the instrument will pad the remaining space with space characters (Hex value = 20x or decimal value = 32). If the text is greater than 40 characters then add another status message and increment the Number Of Messages field.

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If Meteorological Tower Message Type = 0 then see Meteorological Tower Measurement Footer Page.

If Meteorological Tower Message Type = 1 then see Meteorological Tower Status Message Page. This setting should be instrument configurable (turn on/off RadNet Status shipping). When status shipping is turned on, the Meteorological Tower Status is shipped whenever the instrument is ideal or no status change has occurred with the instrument. When the instrument has valid data or upon a status change, it will push data using the Meteorological Tower Measurement Footer. This message is not intended to be the only message being shipped by the instrument.

Example of Meteorological Tower Status Message Format:

RadNet Field	Start Byte Position	End Byte Position	Notes
RadNet Header	1	55	
Meteorological Body	56	72	See example below
Start Of Status Message Footer			
Number of Messages	73	74	Number of Messages=4
Start Of Status Messages Repeating Frame Data			
Status Message 0	75	114	Status Message 0 Value= 'Moving Sample'
End of Status Message 0 Data			
Status Message 1	115	154	Status Message 1 Value = 'Sample Placed'
End of Status Message 1 Data			
Status Message 2	155	194	Status Message 2 Value= 'Stabilizing The Detector'
End of Status Message 2 Data			
Status Message 3	195	234	Status Message 3 Value = 'Calibrating'
End of Status Message 3 Data			
End Of Status Messages Repeating Frame Data			
End Of Status Message Footer			

Example of Meteorological Tower Measurement Message Format:

RadNet Field	Start Byte Position	End Byte Position	Notes
RadNet Header	1	55	
Start of Meteorological Tower Body			
R1	56	59	

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R2	60	63	
Unique Id Preamble	64	67	
Unique ID	68	71	
Met Tower Message Type	72	72	See Met tower Message Types
End of Meteorological Tower Body			
Start Of Meteorological Measurement Message Footer			
Month	73	73	Value = 3
Day	74	74	Value = 29
Year	75	76	Value = 2003
Hour	77	77	Value = 14
Minute	78	78	Value = 33
Seconds	79	79	Value = 12
Number Of Satellites	80	80	Value = 8
Latitude	81	84	Value = 98.234
Latitude Hemisphere	85	85	Value = 25
Longitude	86	89	Value = 103.23
Longitude Hemisphere	90	90	Value = 27
Altitude	91	94	Value = 10325
Altitude Units	95	95	Value = 34
Temperature	96	99	Value = 21.23
Humidity	100	103	Value = 67.344
Wind Direction	104	107	Value = 108
Wind Average Direction	108	111	Value = 107.5
Wind Speed	112	115	Value = 30
Wind Average Speed	116	119	Value = 28.5
Wind Sigma-Theta	120	123	Value = 25
Wind Units	124	124	Value = 31
Stability Class	125	125	
Number of Channels	126	127	Value = 4
Start Of Number of Channels Repeating Frame Data			
Channel 0			

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Channel Number	128	128	Value =15
Channel Type	129	129	Value = 2
Channel Hardware Status	130	130	Value = 0
Channel Operational Status	131	131	Value = 0
Reading	132	135	Value =124.23
Reading Units	136	136	Value = 21

End of Channel 0 Data

Channel 1			
Channel Number	137	137	Value = 0
Channel Type	138	138	Value = 8
Channel Hardware Status	139	139	Value = 0
Channel Operational Status	140	140	Value = 0
Reading	141	144	Value = 2
Reading Units	145	145	Value = 8

End of Channel 1 Data

Channel 2			
Channel Number	146	146	Value = 4
Channel Type	147	147	Value = 0
Channel Hardware Status	148	148	Value = 0
Channel Operational Status	149	149	Value = 0
Reading	150	153	Value = 120
Reading Units	154	154	Value = 0

End of Channel 2 Data

Channel 3			
Channel Number	155	155	Value = 8
Channel Type	156	156	Value = 1
Channel Hardware Status	157	157	Value = 0
Channel Operational Status	158	158	Value = 1

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Reading	159	162	Value = 12345.44
Reading Units	163	163	Value = 5
End of Channel 3 Data			
End of Number of Channels Frame Data			
End Of Meteorological Measurement Message Footer			

Meteorological Tower Message Type Codes

Meteorological Tower Message Type Codes describe the type of message being pushed.

Code	Meaning	Notes
0	Measurement	Meteorological Measurement Data Follows the body. See Meteorological Body Page or Meteorological Tower Measurement Page for more information.
1	Status	Meteorological Status Info Follows the Body. See Meteorological Body Page or Meteorological Tower Status Page for more information

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Meteorological Tower Stability Class Type Codes

Meteorological Tower Stability Class Type Codes indicate the type meteorological stability class.

Code	Meaning	Notes
0	Class A	
1	Class B	
2	Class C	
3	Class D	
4	Class E	
5	Class F	

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Authentication Status Codes

See the following pages for more information concerning RadNet Security Implementation:

[Background Information](#)
[RadNet Security Implementation](#)
[Authentication](#)
[Encryption](#)

These codes indicate whether a RadNet message has been authenticated (message fails signature verification). RadNet message(s) are directed to/at a RadNet Authentication Server (RAS) or other device. The RAS will authenticate the message and set byte 52 to indicate the status of the authentication process. The RAS server will then forward the message to clients on the network. It is important that the RAS server is secure and that the data leaving the RAS server is on a secure network (the message will not be tampered with after authenticated). It is also important to note that the RAS server does not strip the authentication keys from the message, and the authentication process could be done at any time, including storing the authentication signature within a database for future verification of the message.

The Authentication software/server will set this byte value to indicated message signature verification status.

Code	Meaning	Notes
0	Message is Ok	
>0	Message fails signature verification.	

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RadNet Channel Types

Below is a code for type of channel.

Code	Meaning	Notes
0	Alpha	
1	Beta	
2	Gamma	
3	Neutron	
4	Iodine	
5	Noble Gas	
6	Tritium	
7	Stack Flow	
8	Sample Flow	
9	Temperature	
10	Sample Pressure	
11	Leak rate	Primary to secondary, or containment building leak
12	Reactor power	Used for leak measurements
13	Beta + Gamma	The sum of the beta and gamma channels.
14	Latitude	
15	Longitude	
16	Altitude	
17	Humidity	
18	Wind Speed	
19	Wind Direction	
20	Alpha/Beta	
21	Pulse Height Analysis (PHA)	
22	Dust Particle	
23	Humidity	
24	Anemometer	

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RadNet Monitor Type Codes

Bytes (54-55) are code for the instrument type.

Code	Meaning	Notes
0	Gamma Area Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
1	Gamma Crit Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
2	Neutron Area Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
3	Neutron Crit Monitor	Uses the Area Monitor body and footer format. See Area Monitor Header, Body, Footer, and Notes for more information.
4	Alpha CAM	Uses the Alpha CAM body, Measurement Footer, Spectrum Footer. See Alpha CAM Header, Body, Measurement Footer, Spectrum Footer and Notes for more information.
5	Beta CAM	Uses the Beta Cam body and footer format. See Beta CAM Header, Body, Footer and Notes for more information.
6	PCM Monitor	Uses the PCM body and footer format. See PCM Header, Body, Footer and Notes for more information.
7	PCM Portal Monitor	Uses the PCM Body and Footer format. See Portal Header, Body, Footer and Notes for more information.
8	PING	Uses the PING Body and Footer format. See PING Header, Body, Footer and Notes for more information.
9	Glove Box Monitor/Hand Monitor	Uses The PCM Body and Footer format. See PCM Header, Body, Footer and Notes for more information.

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10	Hand And Foot Monitor	Uses The PCM Body and Footer format. See Hand and Foot Header, Body, Footer and Notes for more information.
11	Generic Sensor	Uses The Generic Sensor Body and Footer format. See Generic Sensor Header, Body, Footer and Notes for more information.
12	Electronic Reading Dissymmetry	See Header, ERD Body, ERD Footer, for more information.
13	Item Contamination Monitor (ICM)	Uses The ICM Body and Footer format. See Header, Body, Footer and Notes for more information.
14	Radiation Gateway Monitor	Uses The Radiation Gateway Body and Footer format. See Header, Body, Footer and Notes for more information.
15	Gamma Spectrum	Uses The Gamma Spectrum Body, Measurement, Spectrum, Status and Footer format. See Header, Body, Measurement, Spectrum, Status and Notes for more information.
16	Portable Instruments	Protocol Pending, in development by vendor
17	Meteorology Tower	Uses The Meteorology Tower Body and Footer format. See Header, Body, Measurement, Status, and Notes for more information.
18	Video	Uses The Video Body, Status and Footer format. See Header, Body, Footer, Status and Notes for more information.
19	Image	Protocol Pending, in development by vendor
20	Audio	Protocol Pending, in development by vendor
21	Security data tag/seal	Protocol Pending, in development by vendor
22	Tritium Air Monitor	Protocol Pending, in development by vendor
23	Dust Particle Monitor	Protocol Pending, in development by vendor

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RadNet Message Codes

Byte (03) is the message code. The message code indicates what type of RadNet message has been sent (status, check source, etc.).

Code	Meaning	Notes
0	Normal/Standard RadNet Message	Message is pushed by the instrument and received by the clients.
1	Alarm Ack	Message is pushed by the clients and received by the instruments. See Alarm Acknowledge Alarm Msg. Notes and Alarm Acknowledge Header Format
2	Pass Through	Message is pushed by the instrument and received by the client or can be pushed by the client and received by the instrument. This method can be used for bi-directional communication by the clients and instruments. See Pass Through Msg. Header Notes / Pass Through Header Format or Pass Through Codes
3	Check Source	Message is pushed by the clients and received by the instruments. See Check Source Msg. Notes and Check Source Header Format
4	Diagnostic/Self-Check	Message is pushed by the clients and received by the instruments. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format
5	Request Data	A client/server sends this request to an instrument. In response to this request the instrument will send its current information (Normal RadNet Message). See Request Data Notes and Request Data Header Format
6	Update/Request Date/Time	A client/server sends this request to an instrument. In response to this request the instrument will send/set the date/time. See Update/Request Date/Time Notes and Update/Request Date/Time Header Format
7	Acknowledge Receipt	This message is used by the monitoring computer to acknowledge receipt of data from an instrument. See Acknowledge Receipt Message Header Format and Acknowledge Receipt Message Notes for more information.
255 (FFh)	Encrypted RadNet Message	See the following pages for more information: Background Information RadNet Implementation

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		Encryption Header Message Format Encryption Background Information
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RadNet Operational and Hardware Status Codes

Note: It is the responsibility of the instrument manufacturer to prioritize the operational and hardware status for the instrument. Any status code can be used either as an operational or hardware status code base upon the instrument usage or needs.

Below is a code used to display the Hardware/Operational Status of the instrument. Hardware status is intended to be a troubleshooting guide when responding to an abnormal condition. Instrument hardware malfunctions generally require repair work. Other conditions may be attributed to either hardware or operational problems. Instrument vendors are responsible for classifying conditions and prioritizing the status change. The intention is that only the most critical status change be pushed; however a series of messages based upon a list of status changes could also be pushed. For example: If the instrument detected failures with low voltage and low background, the vendor could push each status in a separate message (at the abnormal push rate). These statuses could then be interpreted by the client as an HV power supply failure.

OP = Guide For Operational Status Use

HW = Guide For Hardware Status Use

Code	Meaning	OP	HW	Notes
0	Normal	Y	Y	
1	High Alarm	Y	N	
2	HV Fail	N	Y	
3	Count Fail	Y	N	
4	Bkg Fail	Y	N	
5	Bkg Update	Y	N	
6	Comm Fail	N	Y	
7	Gas Empty	Y	N	
8	Buffer Full	Y	Y	
9	Acked High Alarm	Y	N	
10	Flow Fail Low	Y	Y	
11	Flow Fail High	Y	Y	
12	Filter Door Open	Y	N	
13	Instrument Not Ready	Y	Y	
14	Instrument In Calibration Mode	Y	Y	
15	Fast Concentration Alarm	Y	N	
16	Slow Concentration Alarm	Y	N	
17	DAC Hours Alarm	Y	N	
18	Count Rate Alarm	Y	Y	
19	Release Rate Alarm	Y	N	

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20	Fast Concentration Alarm Disabled	Y	N	
21	Slow Concentration Alarm Disabled	Y	N	
22	Count Rate Alarm Disabled	Y	N	
23	Check Source Mode	Y	N	
24	Out Of Service	Y	Y	
25	Alert Alarm	Y	N	
26	Trend Alarm	Y	N	
27	Not Initialized	Y	Y	
28	Standby	Y	Y	
29	Local Control	Y	Y	
30	Flush	Y	N	
31	Alarm Disabled	Y	N	
32	External Fail	Y	Y	
33	AC Off	Y	Y	
34	Crit Relay Fail	Y	Y	
35	Out Of Limits	Y	Y	
36	Crit Alarm	Y	N	
37	NV RAM Fail	N	Y	When the instrument's non-volatile RAM cannot be read/written.
38	Check Source Results	N	Y	Indicates that the message with this status carries check source results. This indicates that this message contains the final check source result at the completion of the check source integration. Prior to this code being sent the status code would be 23 (<i>Check Source Mode</i>).
39	Audio Failure	N	Y	Indicates that the instrument has a problem with its audio circuit.
40	Over Range	Y	Y	Indicates that the instrument has exceeded an Over Range value.
41	Diagnostic/Self-check completed, Passed self-check	Y	Y	Indicates that the instrument has performed an Internal Diagnostic/Self-check and found no error conditions. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format

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42	Diagnostic/Self-check completed, Failed self-check	Y	Y	Indicates that the instrument has performed an Internal Diagnostic/Self-check and found error conditions. See Diagnostic/Self-Check Msg. Notes and Diagnostic/Self-Check Header Format
43	High/High Alarm	Y	N	Third alarm level used in many plants.
44	Internal stabilization failure	Y	N	From automatic energy stabilization.
45	Parameter error	Y	N	Bad setup.
46	Temperature failure	N	Y	Temperature out of operational range.
47	Power supply failure	N	Y	From power supply, or from voltage reading.
48	Analog input failure	N	Y	4-20 mA analog input failure (0 mA for example).
49	Filter failure	N	Y	Automatic filter advance failure (motor, end of roll...).
50	Detector cable failure	N	Y	
51	Electronic or Acquisition board failure	N	Y	Electronic failure.
52	Low Battery	N	Y	Backup battery or internal battery has a low voltage condition.
53	Battery Failed	N	Y	Backup battery or internal battery has failed.
54	Clock Failed	N	Y	Internal clock has failed.
55	User defined	Y	Y	This error code is used whenever an instrument supports user defined error codes. It is used whenever there is a desire to inform a user that one of their error conditions has been reached. Since there is no way of knowing what is contained in the error code logic, this generic response should be used to indicate the error.
56	Internal Communication Failure	N	Y	

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RadNet Versions

Note: The last approved version in this list is the current version in use by RadNet.

The second byte (02, byte) is the RadNet version number. This number is used to indicate the version of RadNet be pushed by the server. It is the responsibility of the receiving software to handle all received RadNet messages, although the most current version's functionality may not be provided.

Version	Date Approved	Notes
0	Approved	

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RadNet Units Codes

Below is a code for the RadNet units of the reading.

Code	Meaning	Notes
0	cps	
1	Rem/hr	
2	R/hr	
3	Sv/hr	
4	Bq/cm3	
5	Bq	
6	Degrees Centigrade (C)	Temperature Unit
7	Pascal (Pa)	Pressure Unit
8	cc	Flow Volume Unit
9	cc/sec	Flow Rate Unit
10	cps/cc	Activity Unit
11	counts	Counting Events Unit
12	cm/sec	Velocity Unit
13	bqMeV/cc	Gamma Gas Activity
14	degrees	Wind Direction (180 = south)
15	Gy/hr	Dose Rate Unit
16	RPU%	Reactor Power Unit
17	Kg/sec	Masse flow rate
18	n/cm2	Neutrons / cm2
19	n/cm3	Neutrons / cm3
20	DAC	Derived Air Concentration
21	bq/m3	Becquerel per cubic meter
22	bq/kg	Becquerel per kilogram
23	Latitude	
24	Longitude	
25	Mu_Hemin	Hemisphere North
26	Mu_Hemis	Hemisphere South
27	Mu_Hemie	Hemisphere East
28	Mu_Hemiw	Hemisphere West
29	Mu_Knots	Wind Speed (knots)
30	Mu_KPH	Wind Speed (knots per hour)
31	Mu_MPS	Wind Speed (meters per second)
32	Mu MPH	Wind Speed (meters per hour)

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33	Mu_METERS	Altitude (meters)
34	Mu_Feet	Altitude (feet)
35	Mu_Percent	Humidity
36	Resistance	Electrical Resistance
37	um	Micro-meter

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RadNet Server Status Codes

Byte (7) is a code that displays the status of the server. Codes are provided for normal as well as a variety of abnormal conditions. See Appendix A for Server Status message codes.

Code	Meaning	Notes
0	Normal Operation	
1	Instrument Communication Error	
2	TCP Communication Error	
3	UDP Communication Error	
4	Hard Disk Full	
5	Password Fail	
6	Starting Up	
7	Shutting Down	
8	Program Error	
9	NetWork Access Granted	
10	NetWork Access Denied	